The Structural Diagnostic Toolset (TSDT)

Module II - Coherence Stress Calculator

Formal Perimeter Specification

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Abstract

The Coherence Stress Calculator (CSC) is a perimeter module of the Structural Diagnostic Toolset (TSDT) derived from the Relative Framework. It evaluates whether a system retains explanatory coherence under cumulative explanatory divergence, irreversible information loss, and finite resolution capacity. The module classifies systems as Coherent, Meaning-Saturated, or Coherence-Collapsed. It does not evaluate truth, correctness, or optimality. It detects structural interpretive collapse.

1. Design Axioms

A1. All real systems are constrained.
A2. All non-trivial systems experience irreversible information loss.
A3. Coherence is defined by explanatory compressibility.
A4. Resolution capacity is finite.
A5. Meaning beyond resolution capacity is undefined, not ambiguous.

Systems violating these axioms fall outside module scope.

2. System Formalisation

$S = (X, C, I, E, K, \rho)$

X - State space
$C \subseteq \wp(X)$ - Constraint sets
$I \subseteq \wp(X)$ - Invariants preserving identity

$E = \{ e_i : X \to M \}$ - Explanatory mappings into meaning space M
$K \in \mathbb{R}\geq 0$ - Cumulative irreversible information loss
$\rho \in \mathbb{R}>0$ - Resolution capacity

If a system cannot be expressed in this form, classification returns UNDEFINED.

3. Metric and Projection Primitives

$\delta_E(e_i, e_j)$ - Domain-appropriate distance metric on explanatory outputs.
$||\cdot||$ - Norm on M consistent with δ_E.

Primitives must measure non-compressible explanatory disagreement.

4. Explanatory Spread Function

$\Omega(x) = \Sigma_{i \neq j} \delta_E(e_i(x), e_j(x))$

$\Omega(x)$ measures cumulative divergence between explanations applied to the same state.
Higher $\Omega(x)$ indicates increased explanatory load and declining compressibility.

5. Structural Explanatory Conflict

Conflict arises when multiple explanations must be simultaneously maintained without convergence. Under irreversibility, such conflict accumulates.

6. Irreversibility Condition

$K_\{t+1\} = K_t + \Delta K_t$, where $\Delta K_t \geq 0$.

Lost explanatory compression cannot be recovered without structural reconfiguration.

7. Resolution Capacity

$\rho = \sup \{ \Omega(x) \mid \exists\, x' \in X \text{ such that } \chi_I(x') = 1 \}$

ρ represents maximum explanatory divergence tolerable without coherence collapse.
ρ is fixed during evaluation.

8. Coherence Stress Functional

$\Psi(x) = (\Omega(x) + K) / \rho$

Dimensionless, monotonic, unbounded above.

9. Classification Mapping

$\Psi(x) < 1 \rightarrow$ COHERENT
$\Psi(x) = 1 \rightarrow$ MEANING-SATURATED
$\Psi(x) > 1 \rightarrow$ COHERENCE-COLLAPSED

Outputs are mutually exclusive and exhaustive.

10. Operational Procedure

1. Define system and meaning space.
2. Specify explanatory mappings.
3. Estimate K.
4. Compute or bound Ω(x).
5. Evaluate Ψ(x).
6. Return classification.

No interpretive recommendations are produced.

11. Interpretation Constraints

COHERENT does not imply correctness.
MEANING-SATURATED does not specify which explanation fails.
COHERENCE-COLLAPSED indicates loss of interpretive resolvability.

The module functions as a boundary detector.

12. Scope

Detects:
- Interpretive saturation
- Coherence collapse
- Explanatory boundary conditions

Does not predict:
- Truth
- Behaviour
- Outcomes

13. Structural Integration Statement

Under admissible divergence, monotonic irreversibility, finite resolution capacity, and invariant preservation, the Coherence Stress Calculator constitutes a deterministic perimeter divergence module within TSDT.

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